P 87/4

LESSON 234-307-8.5

STUDENT GUIDE

52D10
POWER GENERATION EQUIPMENT REPAIRER
SKILL LEVEL I

REPAIR THE CONTROL PANEL (ORGANIZATIONAL)

NEWARK PUBLIC LIBRARY
MAY 16 19[illegible]
U. S. GOVT. PUBS.
DEPOSITORY 325

FOR U.S. ARMY RESERVE SCHOOLS

U S ARMY TRAINING SUPPORT CENTER
RESERVE SCHOOLS DIVISION
FORT EUSTIS, VA 23604

PREPARED BY THE
UNITED STATES ARMY ENGINEER SCHOOL
FORT BELVOIR, VIRGINIA 22060

D103.6/5:

READ

TABLE OF CONTENTS

		Page
STUDENT DIRECTIONS:	The directions tell you how to use the lesson.	1
OBJECTIVE:	This tells you what you should be able to do upon completion of this lesson.	2
SELF-CHECK LIST:	These questions let you know how well you are learning the material.	
SET 1	QUESTIONS	
	ANSWERS	
PERFORMANCE TEST DIRECTIONS:	This tells you the hands-on requirements you must meet to successfully complete the task.	11
PERFORMANCE CHECKLIST:	This checklist is used by the instructor to rate you on how well you did on the performance test.	15
REFERENCES:	This is a list of publications you can use when you have questions that the lesson material does not explain.	16

STUDENT DIRECTIONS

READ

This Student Guide will lead you through the "Repair the Control Panel (Organizational)" Lesson step by step. You will start with the directions below. Additional directions will be given to you during the presentation at the top and bottom of the pages in this Student Guide. It is important that you follow the directions exactly and complete each step before going on with the next step. If at any time the directions are not clear or you get lost, ask your instructor for help.

1. Read the Lesson Objective to find out what you are expected to learn. Do this now.

2. Read the Performance Test Directions and study the Performance Checklist. If you think you can pass this test ask the instructor to give you the test now.

LESSON OBJECTIVE

LESSON: Repair the Control Panel (Organizational)

CONDITIONS: Given a 30kw generator set, diesel engine driven (DED), mechanic's tool kit, soldering device, replacement parts, rags, multimeter and TM 5-6115-465-12.

STANDARDS: The student must repair the control panel on the 30kw generator set in accordance with this lesson and TM 5-6115-465-12.

ENABLING OBJECTIVES

The student will be able to:

1. Repair control box assembly components.
    a. Repair the wiring harness.
    b. Replace the wiring harness.
    c. Replace the AC voltmeter.
    d. Replace the AC current meter.
    e. Replace the thermal watt converter.
    f. Replace the rheostats.
    g. Replace the frequency meter.
    h. Replace the frequency transducer.
    i. Replace the switches.
    j. Replace the gages.
    k. Replace the hour meter.
2. Repair generator set controls.
    a. Replace the DC circuit breaker.
    b. Replace the manual speed control.

NOTE: Prior to beginning the lesson, study the diagrams in figures 1 and 2 to familiarize yourself with the components covered in the enabling objectives.

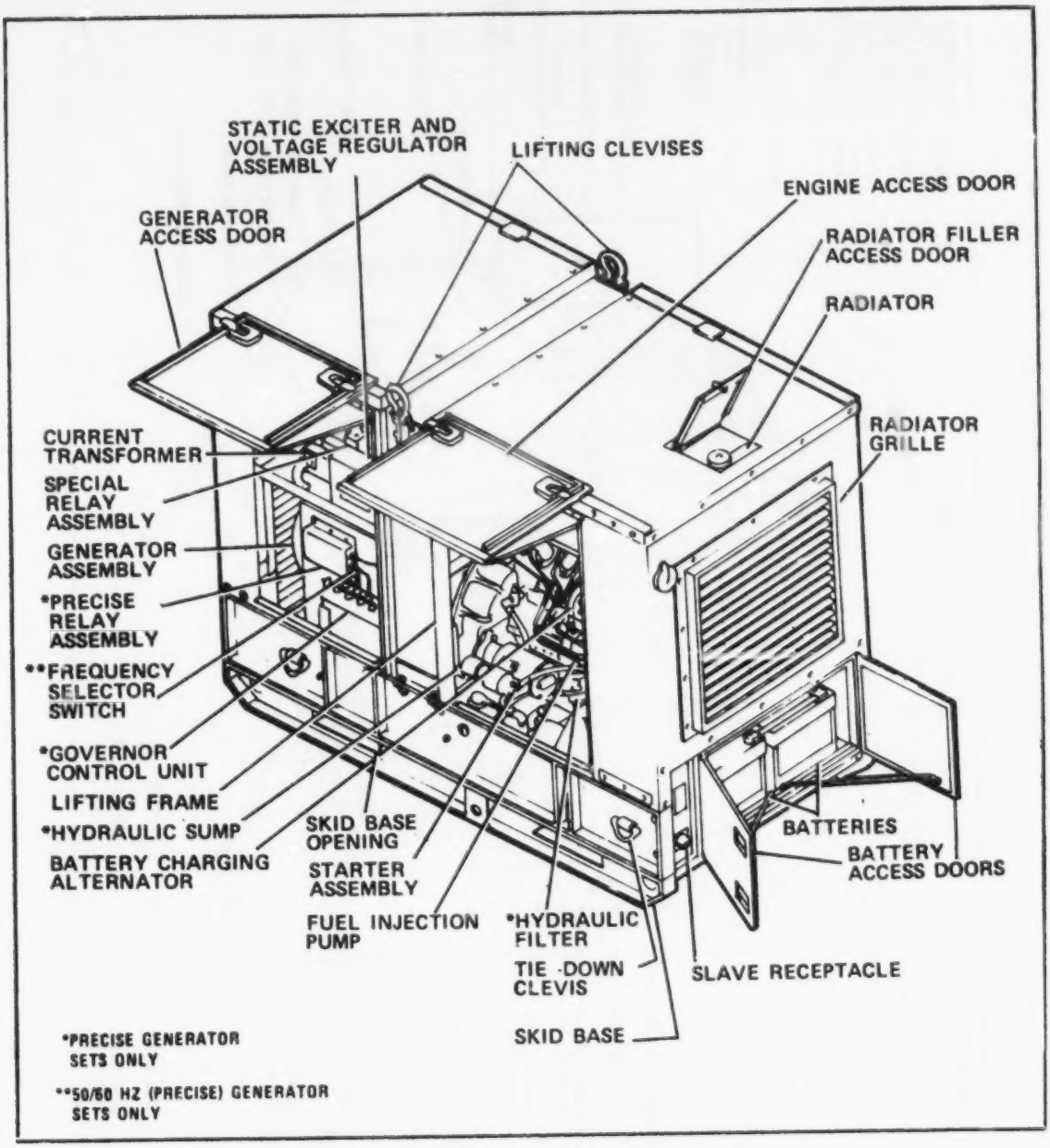
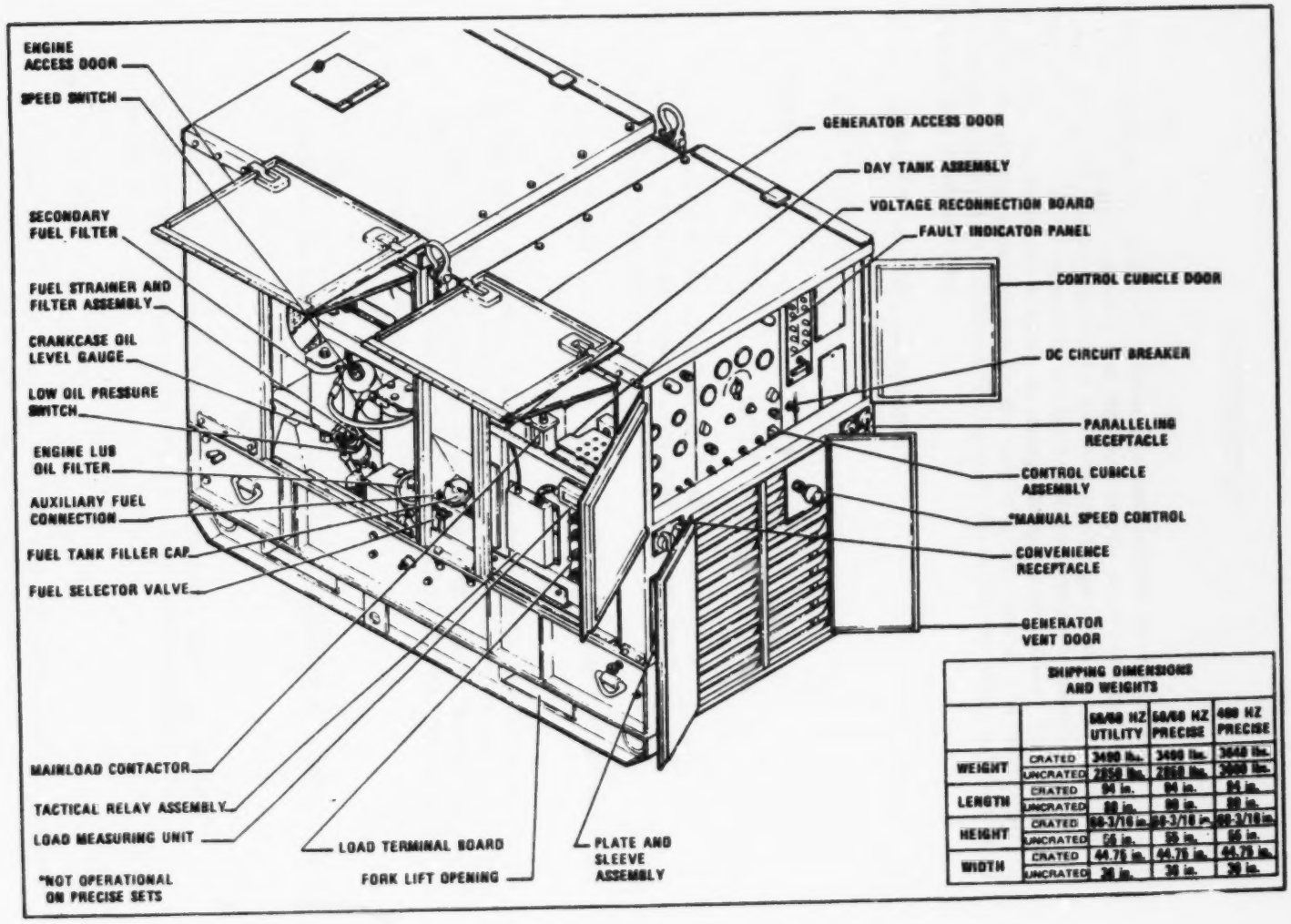


Figure 1. Engine generator set, right-front, three-quarter view

READER FICHE
best copy available



SHIPPING DIMENSIONS AND WEIGHTS

		50/60 HZ UTILITY	50/60 HZ PRECISE	400 HZ PRECISE
WEIGHT	CRATED	3400 lbs.	3400 lbs.	3440 lbs.
	UNCRATED	2850 lbs.	2850 lbs.	2900 lbs.
LENGTH	CRATED	94 in.	94 in.	94 in.
	UNCRATED	88 in.	88 in.	88 in.
HEIGHT	CRATED	68-3/16 in.	68-3/16 in.	68-3/16 in.
	UNCRATED	56 in.	56 in.	56 in.
WIDTH	CRATED	44.75 in.	44.75 in.	44.75 in.
	UNCRATED	36 in.	36 in.	36 in.

Figure 2. Engine generator set, left-rear, three-quarter view

INTRODUCTION

This lesson contains organizational maintenance instructions for the generator set controls. The control cubicle assembly and the fault locator panel contain the controls, instruments, and indicators for controlling and monitoring the operation of the generator set. The 400 Hz and 50/60 Hz tactical precise models incorporate a governor control unit which operates the hydraulic actuator to change the governor setting. This function is fulfilied by the manual speed control on the tactical utility model. The interconnecting wiring harness provies electrical connection between the major assemblies and the control cubicle and fault indicator panel.

1. Repair control box assembly components.

   a. Repair the wiring harness.

      Removal

      NOTE

      In order to repair the wiring harness it will be necessary to remove it. Before disconnecting any electrical lead, tag it securely to aid in reconnection.

      (1) Access to the control panel wiring is gained through a hinged panel (see figure 3).

      (2) Using figure 4, sheet 1 as a guide, disconnect the following harness mount-hardware and remove the wiring harness. Disconnect and remove the wiring harness. Disconnect and remove items 46 through 60 with the exception of item 51. This self-locking nut should not be removed unless its replacement is necessary due to damage.

      (3) Testing

      Check continuity of individual wires with a multimeter or continuity light.

      NOTE

      If more than 30 percent of the wires are damaged or have been repaired, replace the wiring harness and forward it to high level maintenance for rebuilding.

      (4) Installation:

      After the harness has been repaired or a replacement obtained, reinstall the harness in the reverse order of removal procedures.

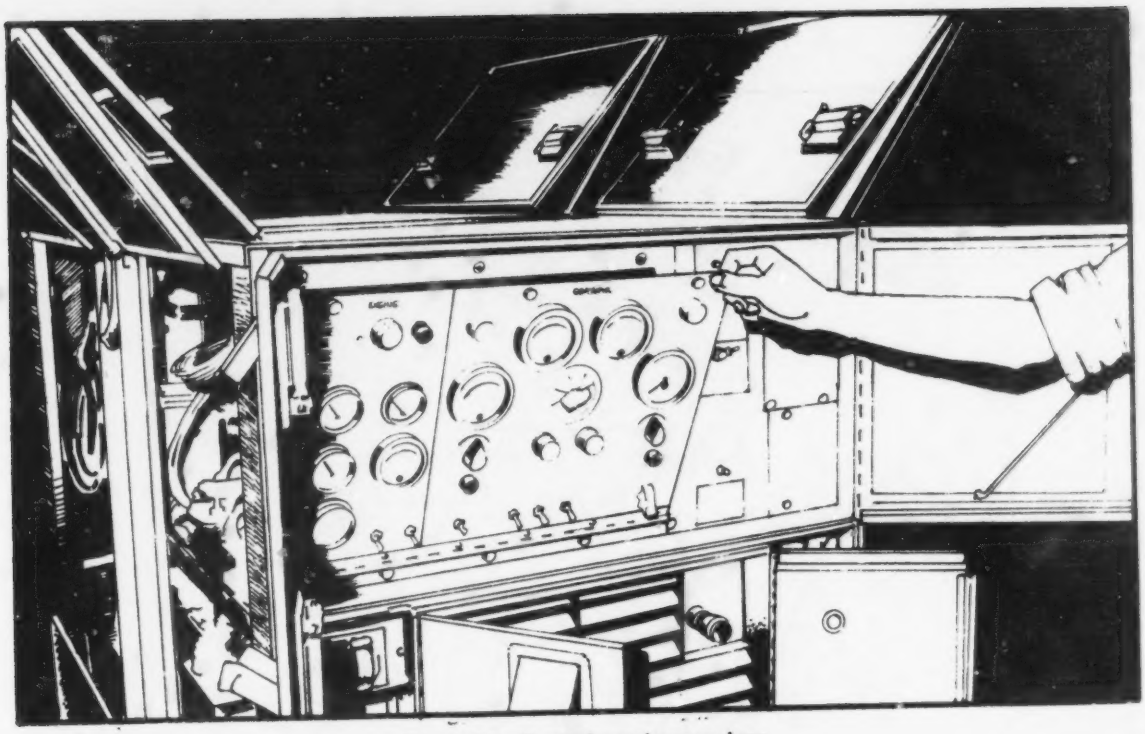


Figure 3A. Control panel access door

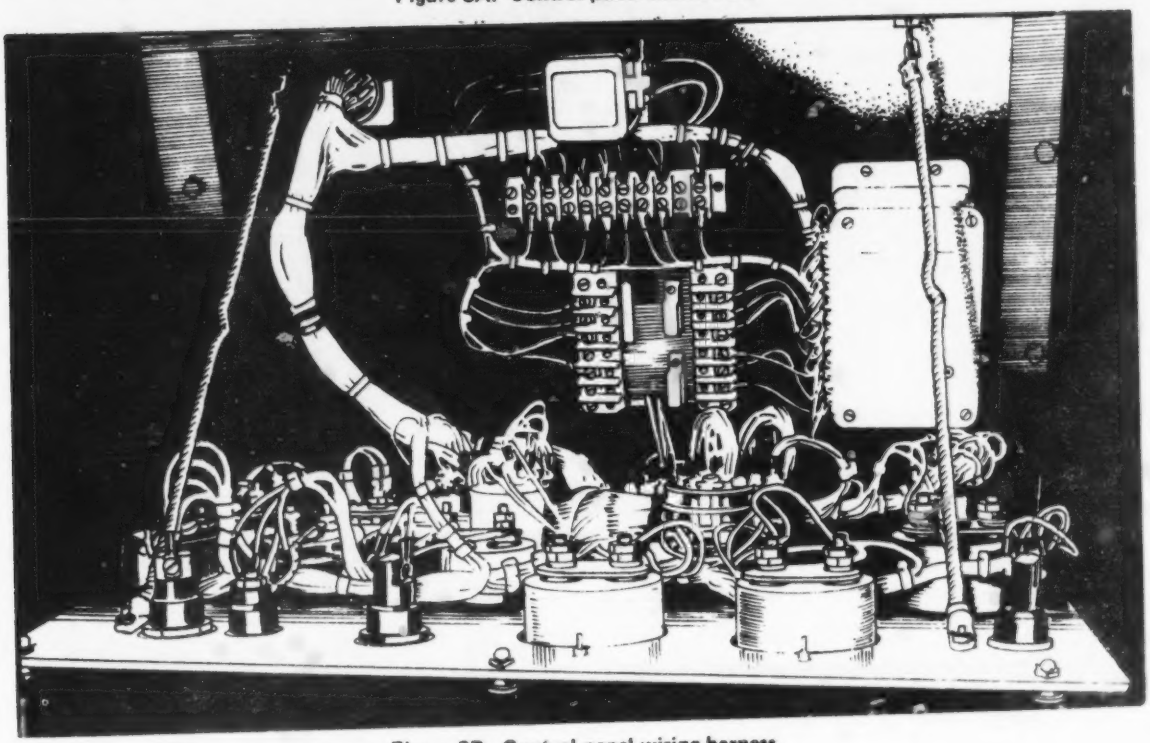


Figure 3B. Control panel wiring harness

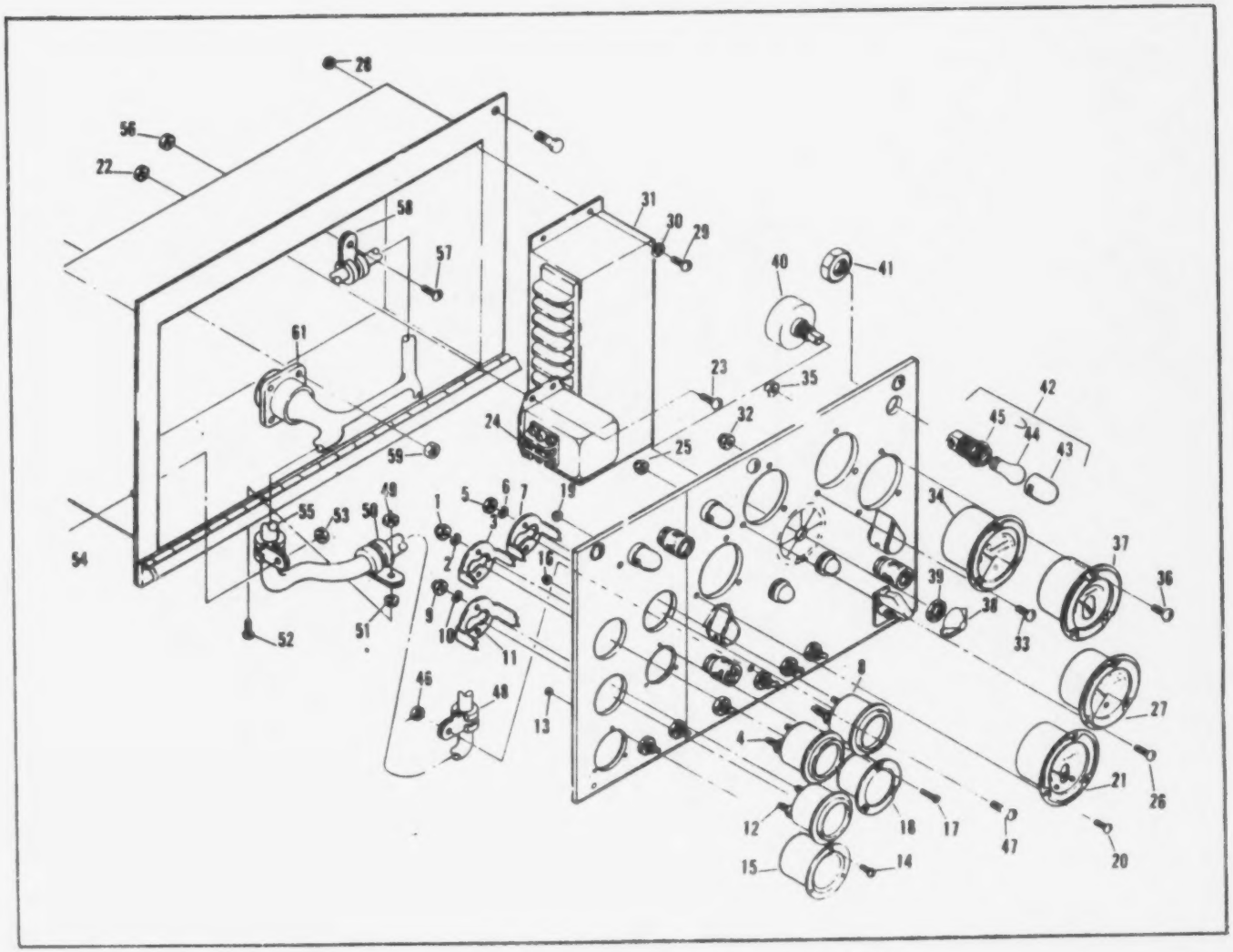


Figure 4. Control cubicle assembly, exploded view (sheet 1 of 3)

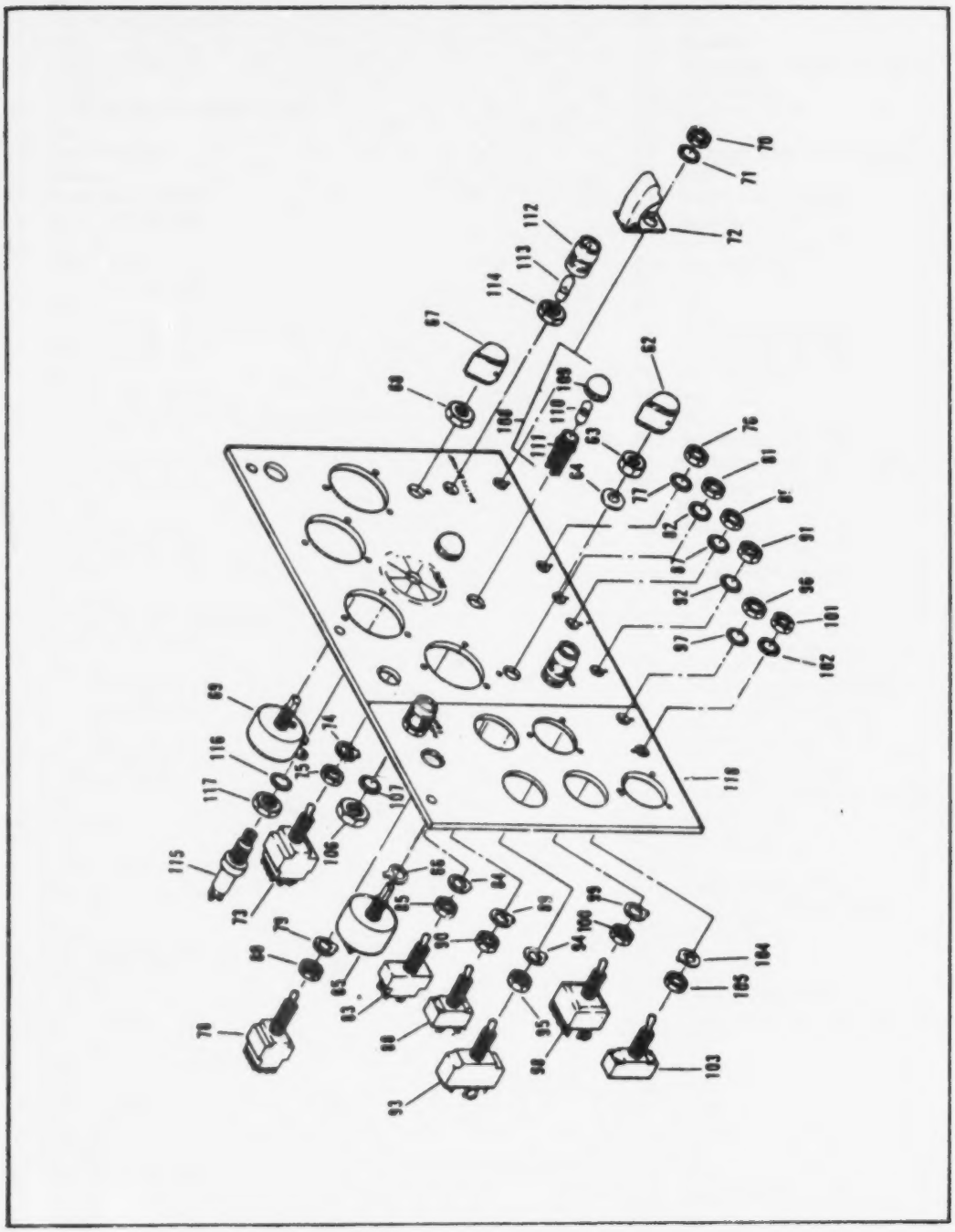


Figure 4. Control cubicle assembly, exploded view (sheet 2 of 3)

1. Nut
2. Lockwasher
3. Clamp
4. Oil pressure gauge
5. Nut
6. Lockwasher
7. Clamp
8. Coolant temperature gauge
9. Nut
10. Lockwasher
11. Clamp
12. Fuel level gauge
13. Self-locking nut
14. Screw
15. Hourmeter
16. Self-locking nut
17. Screw
18. Battery charging ammeter
19. Self-locking nut
20. Screw
21. Frequency meter
22. Self-locking nut
23. Screw
24. Frequency transducer
25. Self-locking nut
26. Screw
27. Kilowatt meter
28. Self-locking nut
29. Screw
30. Washer
31. Thermal watt converter
32. Self-locking nut
33. Screw
34. AC current meter
35. Self-locking nut
36. Screw
37. AC voltmeter
38. Control knob
39. Nut
40. Switch
41. Nut
42. Panel light assembly
43. Cover
44. Lamp
45. Base
46. Self-locking nut
47. Screw
48. Clamp
49. Self-locking nut
50. Clamp
51. Self-locking nut
52. Screw
53. Self-locking nut
54. Screw
55. Clamp
56. Self-locking nut
57. Screw
58. Clamp
59. Self-locking nut
60. Screw
61. Wiring harness assembly
62. Control knob
63. Nut
64. Washer
65. Frequency adjust rheostat
66. Key washer
67. Control knob
68. Nut
69. Voltage adjust rheostat
70. Nut
71. Tooth lockwasher
72. Switch guard
73. Battle short switch
74. Key washer
75. Nut
76. Nut
77. Tooth lockwasher
78. Operations switch
79. Key washer
80. Nut
81. Nut
82. Tooth lockwasher
83. Voltage sensing switch
84. Key washer
85. Nut
86. Nut
87. Tooth lockwasher
88. Panel light switch
89. Key washer
90. Nut
91. Nut
92. Tooth lockwasher
93. Circuit breaker switch
94. Key washer
95. Nut
96. Nut
97. Tooth lockwasher
98. START-RUN-STOP switch
99. Key washer
100. Nut
101. Nut
102. Tooth lockwasher
103. Engine primer switch
104. Key washer
105. Nut
106. Nut
107. Tooth lockwasher
108. Synchronizing light assembly
109. Lens
110. Lamp
111. Base
112. Lens
113. Lamp
114. Nut
115. Base
116. Tooth lockwasher
117. Nut
118. Control cubicle assembly panel

Figure 4. Control cubicle assembly, exploded view (sheet 3 of 3)

b. Replace the AC voltmeter (figure 4, sheet 3).

Removal

(1) Tag and disconnect electrical leads to AC voltmeter (37).

(2) Remove self-locking nuts (35) (figure 4, sheet 3) and screw (36) and remove AC voltmeter (37).

Installation of Replacement Part

(1) Install replacement AC ammeter in accordance with figure 1, sheet 3).

(2) Reconnect electrical leads to AC voltmeter.

c. Replace AC current meter.

Removal

(1) Tag and discsonnect electrical leads to AC current meter.

(2) Remove self-locking nuts (32) (figure 4, sheet 3) and screws (33) to remove AC current meter (34) from panel.

Installation of Equipment

(1) Install the replacement AC current meter in accordance with figure 4, sheet 3.

(2) Reconnect electrical leads to new AC current meter.

d. Replace thermal watt converter.

Removal

(1) Tag and discsonnect electrical lead to thermal watt converter.

(2) Remove self-locking nuts (28) (figure 4, sheet 3), screws (29) and washers (30) to remove thermal watt converter (31) from control box assembly.

Installation of Replacement Part

(1) Install replacement part in accordance with figure 4, sheet 2.

(2) Reconnect all electrical leads

Voltage adjust rheostat removal

(1) Tag and disconnect electrical leads to voltage adjust rheostat.

(2) Loosen setscrews in control knob (67) (figure 4, sheet 2) and remove knob from rheostat shaft.

(3) Remove nut (68) to remove rheostat (69).

Installation of replacement part

(1) Install replacement part in accordance with figure 4 , sheet 2.

(2) Reconnect all electrical leads.

e. Replace the rheostats.

Frequency adjust rheostat (precise set only).

Removal

(1) Tag and disconnect electrical leads to frequency adjust rheostat.

(2) Loosen setscrew in control knob (62) (figure 4, sheet 2), then remove knob from rheostat shaft.

(3) Remove nut (63), washer (64) and keyed washer (66) to remove rheostat from panel.

f. Replace frequency meter.

Removal

(1) Tag and disconnect electrical leads to frequency meter.

(2) Remove self locking nut (19) (figure 4, sheet 1) and screws (20).

(3) Remove frequency meter (21) from panel.

Installation of replacement part

(1) Install the replacement part in accordance with figure 4, sheet 1.

(2) Reconnect all electrical leads.

g. Replace the frequency transducer.

Removal

(1) Tag and disconnect electrical leads to frequency transducer.

(2) Remove self-locking nut (22) (figure 4, sheet 1) and screw (23).

(3) Remove frequency transducers (24) from control box assembly.

Installation of replacement part

(1) Install replacement part in accordance with figure , sheet .

(2) Reconnect all electrical leads.

h. Replace the switches, gages and hour meter.

Removal

(1) Tag and disconnect electrical leads to switches, gages, and hour meter.

(2) Remove all parts in accordance with figure 4.

Installation of replacement parts

(1) Install the replacement parts in reverse order of the order of removal (figure 4).

2. Replace generator set controls.

a. Replace the DC circuit breaker.

Removal

(1) Tag and disconnect electrical leads to DC circuit breaker (figure 4).

(2) Remove mounting nut and tooth lockwasher to remove circuit breaker.

Installation of replacement part

Install the replacement DC circuit breaker in reverse order of removal.

b. Replace the manual speed control.

Removal

(1) Loosen adjustment screw (figure 5, item 1) and remove cable from sleeve.

(2) Remove nut and lockwasher, screw and clip (items 2, 3, 4 and 5).

(3) Remove nut and washer to remove manual speed control cable assembly and grommet (items 6, 7 and 8).

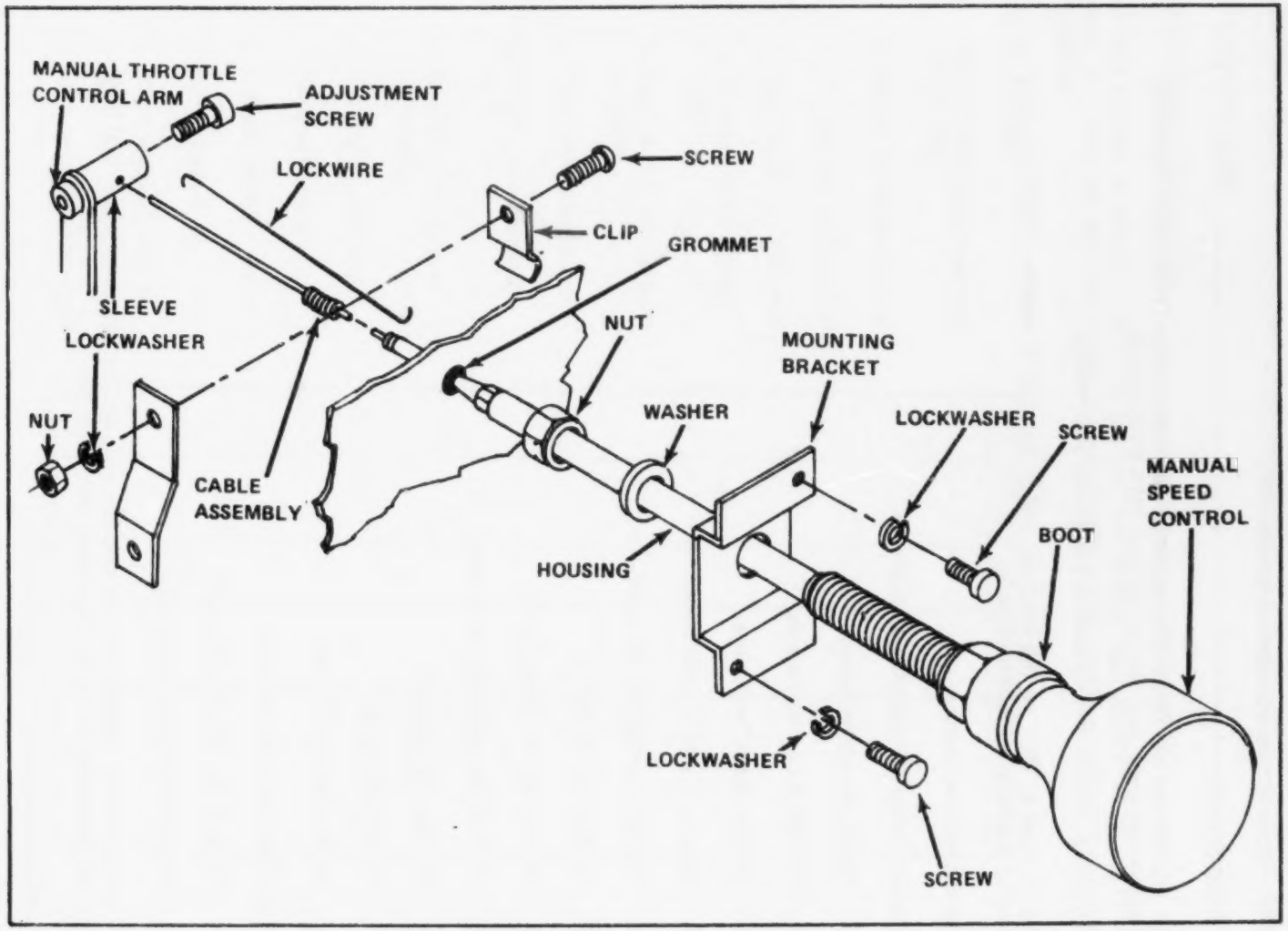


Figure 5. Manual speed control, exploded view

PERFORMANCE TEST DIRECTIONS

LESSON: Repair the control panel (organizational).

TEST DIRECTIONS:

1. At this site you will find a 30kw generator set, diesel engine driven, soldering device, replacement parts, rags, multimeter, and TM 5-6115-465-12.

   All of this material may be used by you during your testing.

2. To be rated a "GO" on this test, you will be required to receive a "GO" on every step of the Performance Checklist.

3. On this test you must:

   Repair control box assembly components.

   a. Repair the wiring harness.

   b. Replace the wiring harness.

   c. Replace the AC voltmeter.

   d. Replace the AC current meter.

   e. Replace the thermal watt converter.

   f. Replace the rheostats.

   g. Replace the frequency meter.

   h. Replace the frequency transducer.

   i. Replace the switches.

   j. Replace the gages.

   k. Replace the hour meter.

   Repair generator set controls.

   a. Replace the DC circuit breaker.

   b. Replace the manual speed control.

4. If you have any questions concerning the test, ask the instructor now. You <u>may not</u> ask the instructor for any help while taking this test.

5. Specific Equipment:

PERFORMANCE CHECKLIST

LESSON: Repair the control panel (organizational)

STUDENT'S NAME: _____

TEST COMPLETION DATE: _____

For the student to receive a "GO" on this test, the student must receive "GOs" on all steps. If during the test the student misses or skips a step, notify or correct him immediately.

Did the Student:	TEST		RETEST		
	GO	NO GO	GO	NO GO	REMARKS
1. Repair control box assembly component.					
a. Repair the wiring harness					
b. Replace the wiring harness					
c. Replace the AC voltmeter.					
d. Replace the AC current meter.					
e. Replace the thermal watt converter.					
f. Replace the rheostats.					
g. Replace the frequency meter.					
h. Replace the frequency transducer.					
i. Replace the switches.					
j. Replace the gage.					
k. Replace the hour meter					
2. Repair generator set.					
a. Replace the DC circuit breaker.					
b. Replace the manual speed control.					

Evaluator's Signature: _____

REFERENCE

TM 5-6115-465-12

☆ U.S. Government Printing Office: 1986—491-036/52410